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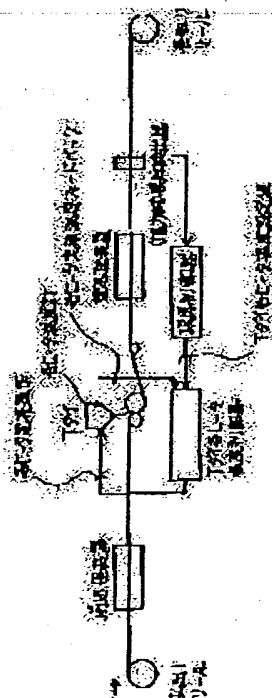
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(54) MANUFACTURE OF LAMINATED METAL SHEET



(57)Abstract:

PURPOSE: To obtain uniform and favorably-shaped coil by preventing thicker film portions or thinner film portions from being piled up at winding-up by a method wherein the temperature of a temperature controlling mechanism is lowered against thicker film thickness portion than the set point and raised against thinner film thickness portion.

CONSTITUTION: Pretreated metal sheet is covered with thermoplastic resin extruded from a T die and applied with after-treatment such as cooling or the like so as to be twined into product and, after its film thickness is measured with a film thickness detector such as an infrared reflection film thickness meter, wound up with a wind-up reel the film thickness is fed back to a film thickness controller so as to be controlled to the set value. When the measured film thickness is thicker than the set point, the temperature of corresponding heater (or temperature controlling mechanism) of the T die is lowered so as to increase

the viscosity of resin in order to decrease the amount of the resin flowing down from the

outlet of the die and consequently reduce film thickness. On the contrary, when the detected film thickness is thinner than the set point, the temperature of the heater is increased, resulting in increasing the film thickness. Thus, thicker portions or thinner portions are prevented from being piled up.

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MEANS

[Means for Solving the Problem] for example, the arithmetic average thickness of the thickness of the portion corresponding to the heater zone which this invention measured the thickness distribution of the cross direction of a T die by the thickness gage, and was divided - desired value and the target range -- comparing -- the thickness target within the limits -- each zone -- the above-mentioned technical problem was solved by making temperature go up and down separately

[0021] That is, if temperature is gone up, a resin carries out a viscous fall, and in order to carry out fluid up, the increase in thickness will be carried out.

[0022] Moreover, if temperature is reduced, a resin will carry out viscous elevation, and in order to carry out fluid down, it will be the method of carrying out thickness reduction.

[0023] Namely, this invention should pass an extruder in the metal plate by which the pressure welding was carried out with the roll of a couple, and one roll interface. In the manufacture method of the lamination metal plate which flows down the thermoplastics fused from the T die, covers thermoplastics to a metal plate, and subsequently rolls round this resin cladding In the range with which are satisfied of the predetermined thickness range from the crosswise thickness which established the temperature-control mechanism divided crosswise [of a T die], and was detected periodically To the thickness portion of a thick eye, the temperature of a temperature-control mechanism is reduced rather than desired value. It is the manufacture method of the lamination metal plate characterized by preventing that raise the temperature of a temperature-control mechanism to the thickness portion of half-closed eyes,

and crosswise thick partial comrades or thin partial comrades of thickness overlap rather than desired value at the time of winding.

[0024] Hereafter, this invention is explained in detail, referring to a drawing.

[0025] In this invention, a thick steel plate and a thick galvanized steel sheet, the zinc-alloy plating steel plate, a tin plated steel plate, a tin-alloy plating steel plate, an aluminum plating steel plate, an aluminium alloy plating steel plate, or a stainless steel board of board thickness etc. is first used as a metal substrate from the use used for building materials, such as a roof, a wall, and a partition, the charge of automobile material, the material of a home electrical-and-electric-equipment product, furniture, a can, etc.

[0026] Furthermore, what has an about 0.1-5micro chemical-conversion layer on this is contained.

[0027] In order that a chemical conversion may raise the corrosion resistance of a metal substrate, oxidation resistance, and adhesion, it is performed as surface treatment of a metal plate, and is performed by phosphoric-acid zinc processing, phosphoric-acid iron processing, or the electrolytic chromate treatment.

[0028] Furthermore, after not performing a chemical conversion or performing a chemical conversion, what has an adhesives layer on this is contained.

[0029] An adhesives layer is a layer which applied about several [at least]micro adhesives, in order to improve the adhesion of a metal substrate and thermoplastics.

[0030] As these adhesives, the adhesive thermoplastics which has functional groups, such as a denaturation polyethylene resin, a denaturation epoxy resin, and denaturation vinyl resin, is suitable.

[0031] Adhesion is good for the both sides of a metal and the thermoplastics used for covering, for example, in the case of a polyolefine covering steel plate, a denaturation polyolefine like an ethylene-vinyl acetate copolymerization resin or an ethylene-acrylic-acid copolymerization resin is suitable for these.

[0032] The thermoplastics used for covering by this invention For example, a polyethylene-terephthalate resin, Polyolefin resin, acrylic resin, polyester resin, polyamide resin, Vinyl chloride resin, a fluororesin, polycarbonate resin, a polystyrene system resin, ABS plastics, a chlorinated-polyether resin, a urethane resin, etc. are typical. to polyolefin resin There are a polymer or copolymers, such as ethylene, a propylene, 1-butene, and 1-pentene. as acrylic resin There are a polymer or copolymers, such as an acrylic acid, a methacrylic acid, an acrylic ester, methacrylic-acid ester, and an acrylamide. to polyester resin There are a polyethylene terephthalate, oil free polyester, etc. to polyamide resin There are the so-called Nylon 66, nylon 6, Nylon 610, Nylon 11, etc. to vinyl chloride resin There is a copolymer with vinyl acetate, others, for example, ethylene, etc., and there are a polytetrafluoroethylene, a 3 ****-ized ethylene chloride resin, a 6 ****-ized ethylene propylene resin, ****-ized vinyl resin, ****-ized vinylidene resin, etc. in a fluororesin. [homopolymer]

[0033] Moreover, you may mix and use two or more resins. Moreover, the additive usually used at the time of film creation, for example, a degradation inhibitor, the modifier, the pigment, etc. may be included.

[0034] Moreover, in case it covers with a melting state, you may add cross linking agents, such as amino resin and an epoxy resin, in the range which does not lose a fluidity.

[0035] These thermoplastics is suitably chosen according to needs, such as weatherability, cold district fitness, thermal resistance, scratch-proof nature, resistance to contamination, chemicals-proof nature, and deep-drawing processability, according to the use of a surface treatment metal plate. For example, a polyolefine is excellent in cold resistance, a polyamide is excellent in abrasion resistance, acrylic resin is excellent in resistance to contamination or chemicals-proof nature, and it is excellent [a fluororesin] in weatherability etc.

[0036] The polyethylene-terephthalate resin is especially useful for an acid-proof use.

[0037] Multilayer covering of that monolayer covering is also of the same kind or a different-

species resin is sufficient as a resin. In multilayer covering (for example, a multilayer T die), it can carry out, and a glue line can also be prepared between layers.

[0038] At an interlayer thermoplastics in the upper layer for an adhesive resin to a lower layer for example, by the three-layer T die [the steel plate which is applying and preheating adhesives] [the thermoplastics in a melting state] It can extrude in the shape of a film, and the surface treated steel sheet which carried out multilayer covering directly and continuously can be obtained. Or thermoplastics can be obtained in the 1st lower layer and the surface treated steel sheet which extruded thermoplastics in the shape of a film by the four-layer T die in the 4th best layer at the 3rd interlayer, and carried out multilayer covering of the adhesive resin directly and continuously can be obtained for the adhesive resin which is in the steel plate which is preheating at a melting state to the 2nd interlayer.

[0039] Drawing 1 explains a manufacturing process below.

[0040] A metal substrate precedes covering a melting resin, and in order to raise adhesion, it is necessary to preheat it.

[0041] For example, in the case of a polyethylene terephthalate, the preheating of -120 degrees C or more (therefore, about 135-255 degrees C) of melting points (255 degrees C) is desirable.

[0042] By carrying out a preheating, the fluidity of a resin increases and adhesion improves.

[0043] When not performing a preheating, or when preheat temperature is low and a cooling roller is especially used, the adhesion of a resin is not enough and a result which lacks in corrosion resistance is brought.

[0044] Although the temperature of a preheating is so desirable that it is high since the fluidity of a resin increases, since a resin and adhesives will decompose if too high, it is not desirable. Moreover, it is not desirable from a viewpoint of energy saving.

[0045] Therefore, it is preferably carried out below the temperature of a melting resin by temperature lower 50 degrees C or more than the temperature of a melting resin, and the preheat temperature of about 50-230 degrees C of usual.

[0046] Drawing 1 carries out the pressure welding of the sticking-by-pressure roll 5 to the front face of the metal substrate 1 which twisted and was twisted around the roll 4 and which it preheated, flows down the thermoplastics 3 fused from T die 2 through the extruder to the interface of the metal substrate front face and sticking-by-pressure roll 5, and shows the surface treatment metal plate manufacture method of ***** (ing) thermoplastics to the metal substrate 1.

[0047] Moreover, drawing 2 flows down the thermoplastics 3 fused from T die 2 through the extruder to the interface of the metal substrate 1 which it preheated, and roll 4', and shows the surface treatment metal plate manufacture method of ***** (ing) thermoplastics to the metal substrate 1.

[0048] Regulation of film ** or a surface state is easy for this method. For example, it is also easy regulation of surface gloss and to give an embossing pattern to a front face.

[0049] As for the metal substrate 1 with which the elevated-temperature melting resin 3 was covered, cooling ***** is performed. Even if cooling may perform a water spray for example, after air cooling and it makes it pass through a water-cooled tub, you may let a cooling roller pass.

[0050] Drawing 3 is explanatory drawing showing the state where the heater 8 was attached in T die 2, and drawing 4 is explanatory drawing of the temperature-control mechanism (heater ** - ** show drawing.) decomposed crosswise [of T die 2].

[0051] Drawing 5 is control process drawing of this invention. It pays out by the expenditure reel, and the thermoplastics extruded by the T die is covered, after treatment, such as cooling, is received, it becomes a product, thickness is measured with thickness detectors, such as an infrared reflective formula thickness gage, and the metal plate which received pretreatment of a chemical conversion, a preheating, etc. is rolled round by the machine reel.

[0052] The detected thickness is fed back to a thickness-control machine, and operates the set point (temperature set point) of the temperature selector of T die each heater.

[0053] On the other hand, the temperature selector of T die each heater adjusts the temperature of each heater by feedback control as the set point.

[0054] That is, if the temperature of the heater (temperature-control mechanism) at which a T die corresponds is reduced when the thickness of a thick eye is detected rather than the predetermined range (desired value) so that it may be restored to predetermined thickness within the limits at the time of normal, the viscosity of a resin will increase, the amount of resins which flows down from a dice outlet will become less, and thickness will decrease.

[0055] On the contrary, if the temperature of the temperature-control mechanism in which a T die corresponds is increased when the thickness of a low eye is detected rather than desired value, the viscosity of a resin will fall, the amount of resins which flows down from a dice outlet will increase, and thickness will increase.

[0056] Thus, it can prevent that crosswise thick partial comrades or thin partial comrades of thickness overlap, and even if it winds in the shape of a coil, a coil with a sufficient configuration without irregularity can be manufactured.

[0057] An example explains below.

EXAMPLE

[Example] After using the lamination metal plate manufacturing installation which used one pair of rolls with an outer diameter of 300mm and preheating this steel plate, using an electrolysis chromate-treatment steel plate with a thickness of 0.2mm as a metal plate, melting extrusion flowing down of the polyethylene terephthalate was carried out from the T die through the extruder at the interface with the roll with which the above-mentioned steel plate and the steel plate have not coiled.

[0059] 280 degrees C and covering thickness were set to 100micro, and line speed set resin temperature to 50mpm(s).

[0060] The thickness target range was set to 90-110micro, and performed the temperature control of this invention.

[0061] The crosswise thickness distribution as shown in drawing 6 at first was obtained, and this arithmetic average value is 100micro, and made this desired value.

[0062] To this desired value, rather than desired value, the arithmetic average value of the thickness of the zone corresponding to heater **, **, **, and ** is a thick eye, and reduced the heater temperature of this zone by 15 degrees C.

[0063] Moreover, the zone corresponding to heater **, **, and ** is half-closed eyes, and made such heater temperature increase by 15 degrees C.

[0064] The thickness distribution as shown in drawing 7 as a result was obtained, and the heater temperature of the zone corresponding to heater **, **, **, and ** was made to increase by 15 degrees C shortly, and the heater temperature corresponding to heater **, **, and ** was reduced by 15 degrees C.

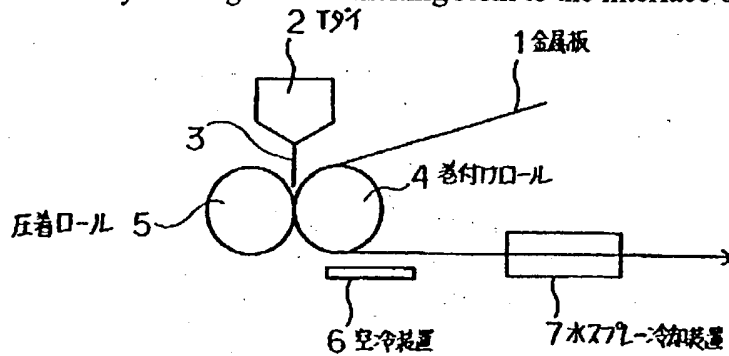
[0065] The above-mentioned temperature control was carried out at intervals of about 30 minutes, and even if wound in the shape of a coil, the coil with a sufficient configuration without irregularity has been manufactured.

[0066] Moreover, the temperature control of this invention was not performed, but when it was fixed and heater temperature was operated, **** occurred by the part corresponding to the thick eye of a thickness distribution, i.e., the portion of a mountain, shown in drawing 6, and it became a coil with a very bad configuration.

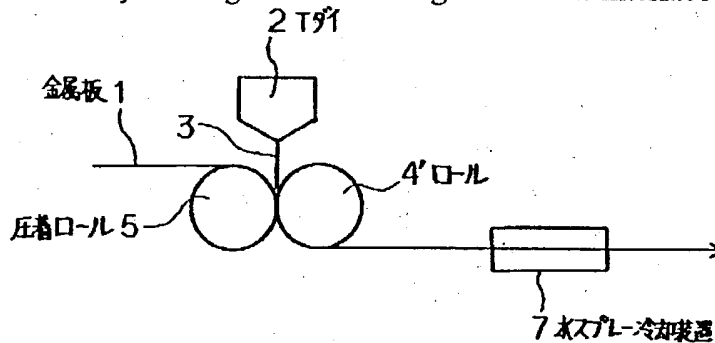
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

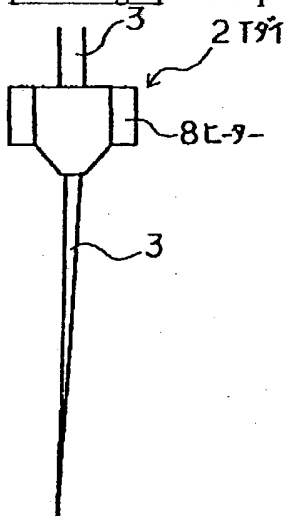
[Drawing 1] It is explanatory drawing of the invention-in-this-application method which covers by flowing down a melting resin to the interface of a metal substrate and a roll.



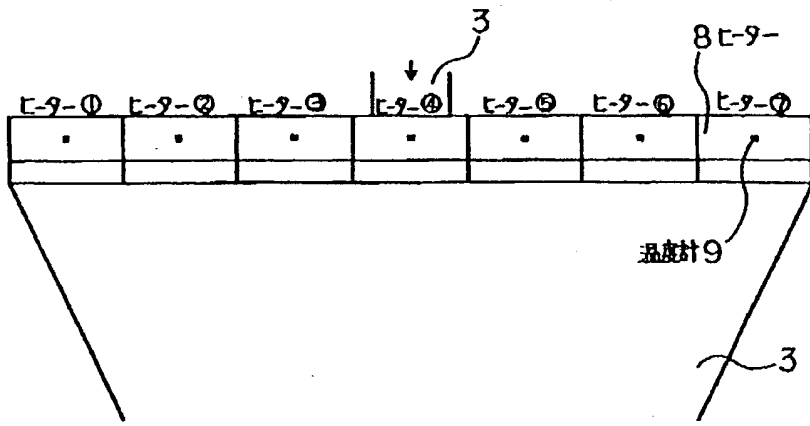
[Drawing 2] It is explanatory drawing of the invention-in-this-application method which covers by flowing down a melting resin to the interface of a metal substrate and a roll.



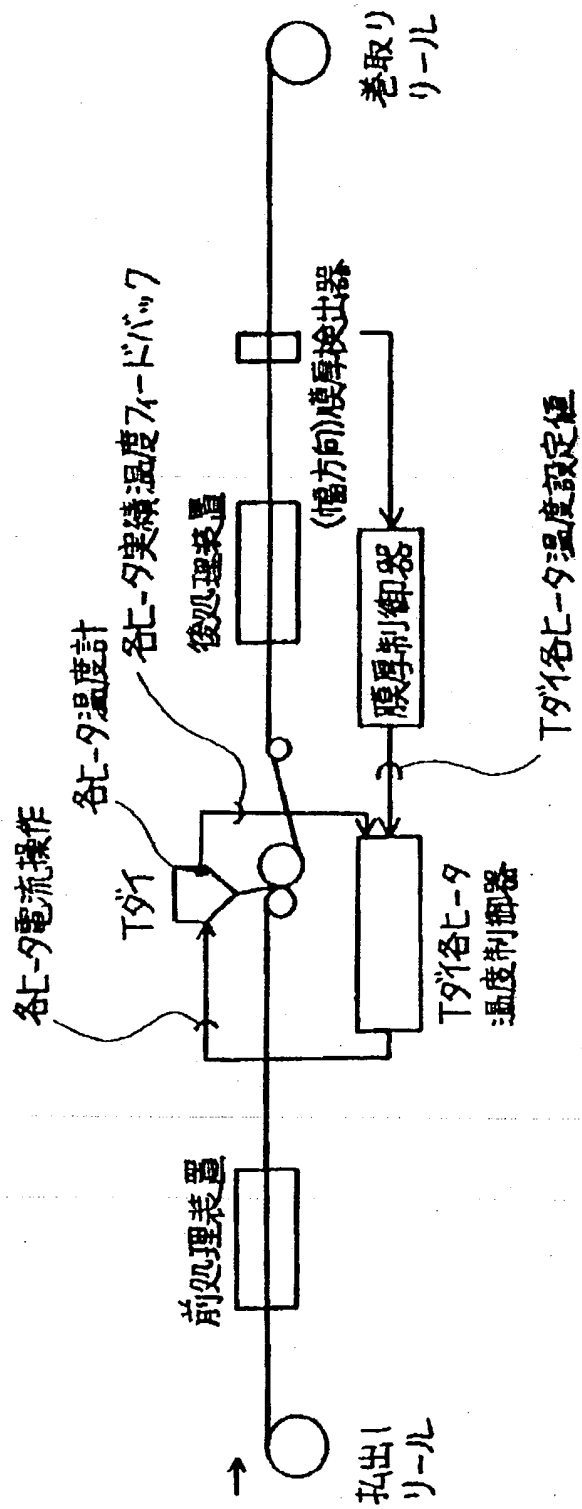
[Drawing 3] It is explanatory drawing of the T die which attached the heater.



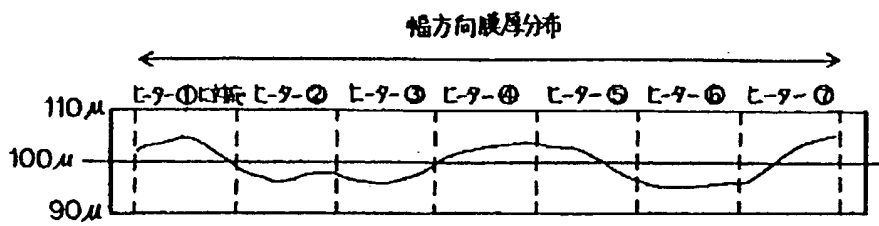
[Drawing 4] It is detailed explanatory drawing of the T die which attached the heater.



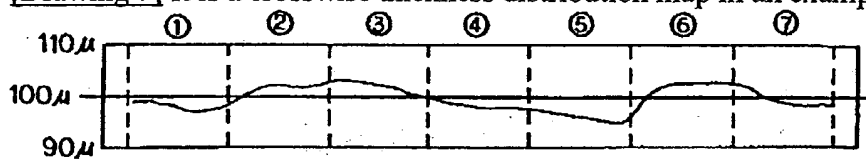
[Drawing 5] It is this invention outline process drawing.



[Drawing 6] It is a crosswise thickness distribution map in an example.



[Drawing 7] It is a crosswise thickness distribution map in an example.



[Description of Notations]

- 1 Metal Plate
- 2 T Die
- 3 Thermoplastics
- 4 Twist and it is Roll.
- 4' Roll
- 5 Sticking-by-Pressure Roll
- 6 Cooling System
- 7 Water Spray Cooling System
- 8 Heater
- 9 Thermometer

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